

Screening for Lead at the Domestic Refugee Medical Examination

Background

Epidemiology and Geographic Distribution:

Following the phase-out of leaded gasoline and the ban on lead-based paint, the prevalence of lead poisoning, as defined by a blood lead level (BLL) ≥ 10 $\mu\text{g}/\text{dL}$, among children in the United States has dramatically declined since the 1970s, decreasing from 78% during 1976-1980 to 1.6% during 1996-2002.¹ In contrast, refugee children arriving in recent years have much higher rates of elevated BLL on average when they enter the United States, due to exposures prior to relocation. In addition, refugee children are at above-average risk for lead poisoning from exposures within the United States, because they typically settle into high-risk areas and substandard housing.

In areas of the world where many refugees originate, potential lead exposures include lead-containing gasoline combustion, industrial emissions, ammunition manufacturing and use, burning of fossil fuels and waste, and lead-containing traditional remedies, foods, ceramics, and utensils.^{2,3}

Among 299 refugee children under the age of 6 years from 25 countries arriving to Minnesota during 2000-2002, 22% had a BLL of ≥ 10 $\mu\text{g}/\text{dL}$.² This finding indicates that the prevalence of lead poisoning in newly arrived refugee children may be 14 times greater than that of the general U.S. population of comparable age. Among the children with elevated BLLs, 29 (45%) had levels from 10 to 14.9 $\mu\text{g}/\text{dL}$, 15 (23%) had levels from 15 to 19.9 $\mu\text{g}/\text{dL}$, and 21 (32%) had levels from 20 to 44.9 $\mu\text{g}/\text{dL}$. Of the children with BLLs from 20 to 44.9, 19 were from sub-Saharan Africa and two were from Bosnia and Herzegovina.

Although children from all regions of the world are at risk for having elevated BLL, this risk appears to vary to some degree. In an analysis of screening data from Massachusetts, the prevalences of elevated BLL among newly arrived refugee children under 7 years old were 7%, 25%, 27%, 37%, and 40% among those from Northern Eurasian countries, the Near East

(predominately Iraq), Africa, Asia (predominately Vietnam), and Central American/Caribbean countries, respectively. None of 33 Bosnian children born in Germany had elevated BLL. This finding suggests that birthplace and other areas of residence are more important than ethnicity as predictors of elevated lead levels.³

Ongoing lead exposure among refugee children within the United States has been well documented. Reports from Massachusetts and New Hampshire indicate that 6%-29% of children who have normal BLL at new arrival screening may have elevated BLLs when retested several weeks later.^{3,4} Malnutrition is a known risk factor for increased BLL. In New Hampshire, malnutrition was commonly identified in refugee children with elevated BLL (22 % had a low weight-for-height ratio and 35% had a low height-for-age ratio at the time of repeat testing). The median age of those with elevated BLL on repeat testing was 4.9 years (range 14 months to 13 years), which is considerably older than the age cutoffs for recommended screening for most children in the United States. The most common lead exposures identified among children with elevated BLL at repeat testing were lead-based paints and lead-contaminated soil where the children had played. Of the refugee children in New Hampshire with BLLs >15 µg/dL, 89% lived in rental homes built before 1978, when lead-based paints were still used. Furthermore, two-thirds of the parents reported witnessing behaviors by their children that may increase lead exposure, such as frequently putting nonfood items into their mouths (pica), picking at loose paint, plaster or putty, or chewing on painted surfaces. Investigators also noted limited parental awareness of the dangers associated with lead exposure.⁴

In addition to exposure to lead-based paints and contaminated soil, refugee children are vulnerable to other unique sources of lead exposure. A variety of foods, candies, and traditional therapies have been found to be the source of exposure for many immigrant children (Table).

Refugee Populations at Risk

Refugee children originating in all regions of the world, especially those from resource-poor countries, are at risk of having lead poisoning upon arrival to the United States. Malnourished children may be at increased risk for lead poisoning, likely through increased intestinal lead absorption mediated by micronutrient deficiencies. The best-studied micronutrient deficiency related to lead levels is iron deficiency. Iron-deficient children are at increased risk for developing lead poisoning.⁵ Deficiencies in calcium and zinc may also increase a child's risk.⁶

Clinical Presentation

Since 1991, the value indicating elevated BLL has been ≥ 10 $\mu\text{g/dL}$. Above this value, lead is known to impair intelligence and neurodevelopment.⁶ However, more recent studies have suggested that children's mental and physical development can be adversely affected at blood lead levels < 10 $\mu\text{g/dL}$ [see Interpreting and Managing Blood Lead Levels < 10 $\mu\text{g/dL}$ in Children and Reducing Childhood Exposures to Lead: Recommendations of CDC's Advisory Committee on Childhood Lead Poisoning Prevention; MMWR 2007;56;1-14;16.

<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5608a1.htm>] .In fact, the results of one study suggest that the magnitude of the decrease in intelligent quotient (IQ) for each incremental increase in BLL is greatest among those children with levels below 10 $\mu\text{g/dL}$.⁷ At levels higher than 10 $\mu\text{g/dL}$, more acute symptoms may appear. Above a level of 60 $\mu\text{g/dL}$, individuals may experience headaches, abdominal pain, anorexia, constipation, clumsiness, agitation, and lethargy.⁸ At BLLs as low as 70 $\mu\text{g/dL}$, children may develop severe neurologic complications, including seizures, ataxia, mental status changes, coma, and death.⁶ Although such severe poisonings are rare in 2000, a 2-year-old Sudanese refugee girl with a BLL of 392 $\mu\text{g/dL}$ died 5 weeks after arrival to the United States. This was the first lead poisoning-related death in the U.S. in 10 years and underscores the unique vulnerability of refugee children to this condition.⁹

Medical Screening

Screening and Testing Prior to Departure for the United States

None

Recommendations for Post-Arrival Evaluation

Driven by the above data on lead poisoning in refugee children, the U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Childhood Lead Poisoning Prevention Branch and Division of Global Migration and Quarantine, in collaboration with the U.S. Department of State, Bureau of Population, Refugees and Migration, developed the following recommendations to address lead exposure among refugee children. (The full document is available at: www.cdc.gov/lead/factsheets/refugeechildrenfactsheet.htm.)¹⁰

1. *Identification of Refugee Children with Elevated Blood Lead Levels.* Check BLL of all refugee children 6 months to 16 years of age at the time of arrival to the United States.
2. Children younger than 6 years of age should undergo clinical nutritional assessments as well as testing for hemoglobin or hematocrit level, with one or more of the following: mean corpuscular volume (MCV) with red cell distribution width (RDW), ferritin, transferrin saturation, or reticulocyte hemoglobin content.
3. Follow-up blood lead testing should be done on all refugee children aged 6 months to 6 years, 3-6 months after their placement in a permanent residence.
4. Provide daily pediatric multivitamins with iron to all refugee children 6-59 months of age when they arrive in the United States.

The status of most refugee children entitles them to Medicaid, the Women, Infants and Children's Program (WIC), and other social services for at least 8 months after their resettlement, regardless of the family financial status.

Evaluation and Treatment of Refugees with Elevated Blood Levels

An in-depth discussion of management of lead is beyond the scope of this document. If a child has a BLL ≥ 10 $\mu\text{g}/\text{dL}$, clinicians should refer to the reference "Managing Elevated Blood Lead Levels Among Children" prepared by the CDC, which can be obtained at <http://www.cdc.gov/lead/scientificandeducation.htm> . Further information on history taking, medical management, environmental assessments and follow-up testing is available at <http://www.cdc.gov/nceh/lead> . Many of the questions typically asked of children in the United States are not pertinent for refugees, since they might have recently relocated (moved) away from some sources of exposure. However, children's lead levels may increase in a relatively short amount of time (within weeks), and so typical exposures should be solicited. These questions might ask about such exposures as peeling paint in their current residence and whether the child spends significant amounts of time in play areas with bare soil. In addition, folk remedies, traditional therapies, pottery or metal vessels and imported foods may be of particular concern in refugee populations, and these risks should be assessed in a culturally sensitive manner (Table). Case reports have identified parents who denied giving "folk remedies" to their children with high BLL, even when the ultimately identified source is a culturally specific remedy. This confusion may be explained by differences in what are considered "folk remedies" between clinicians and

parents. If no lead sources can be identified in children with lead poisoning, clinicians should consider checking BLLs in other family members. If other family members of various ages have elevated levels, a shared source exposure, such as ceramic ware, spices, foods and remedies, may be present.^{12, 13, 14}

Appropriate management of children with confirmed elevated blood lead levels is based on the extent of the elevation (www.cdc.gov/nceh/lead/CaseManagement/caseManage_chap3.htm).

Follow-up testing is mandatory for all children with documented elevated venous blood lead levels, in addition to the special refugee groups mentioned above, who should be re-evaluated regardless of their initial level. Trends are especially important in refugee populations since, although they may have left the environment of exposure when they migrated, they are generally moving into high-risk housing in the United States.⁴ It is not unusual for a child's lead level to continue to rise after migration to the United States, which would demand formal environmental evaluation. Information on recommended follow-up testing can be found at:

http://www.cdc.gov/nceh/lead/CaseManagement/caseManage_main.htm. Children with elevated levels should be reported to State Childhood Lead Poisoning Prevention Programs (CLPPP) or the appropriate State contact. State and local program contacts may be found at:

www.cdc.gov/nceh/lead/grants.contacts/CLPPP%20Map.htm.

Additional Information

CDC Lead Poisoning Prevention in Newly Arrived Refugee Children: Tool Kit

(This educational kit has modules intended for both Refugee Resettlement Workers and Medical Providers. It can be downloaded from

http://www.cdc.gov/nceh/lead/Publications/RefugeeToolKit/Refugee_Tool_Kit.htm

CD-ROM copies can be obtained by calling 1-800-CDC-INFO)

CDC.

References

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Table. Examples of Culture-specific Exposures Associated with Elevated Lead Levels in Children

Exposure	Area of Origin	Reported Uses	Description
‘Pay-loo-ah’	Southeast Asia	Treatment of fever and rash	Orange-red powder. Administered by itself or mixed in tea.
Greta	Mexico	Treatment of digestive problems	Yellow-orange powder. Administered with oil, milk, sugar or tea. Sometimes added to baby bottles and/or tortilla dough.
Azarcon	Mexico	Treatment of digestive problems.	Bright orange powder. Administered similarly to greta.
Litargirio	Dominican Republic	Deodorant/antiperspirant and treatment of burns and fungal infections of the feet.	Yellow or peach-colored powder.
Suma	India	Improve eyesight	Black powder administered to inner lower eyelid.
Unidentified ayurvedic	Tibet	Treatment for slow development	Small gray-brown balls administered several times a day.
Lozenna	Iraq	Added to rice and meat dishes for flavor	Bright orange spice.
Tamarind candies (multiple brand names)	Mexico	Lollipops, fruit rolls, candied jams.	‘Bolirindo’ lollipops are soft and dark brown. Candied jams are typically packaged in ceramic jars.
Lead-glazed ceramics	Often made in Latin America	Beanpots, water jugs	
Make-up and beauty products	Multiple cultures	Decoration	Many types